

REMARKS

Claims 1-3 and 6-11 are pending in the present application. Claims 7-11 are currently withdrawn from consideration. Claims 1 and 6 have been amended. An early consideration and Notice of Allowance are respectfully requested.

No new matter has been added by way of the above amendments. Claim 6 has been amended to depend from claim 1. The recitations in claim 1 are supported in the present specification, *inter alia*, at page 11, lines 12-15; page 22, line 18 to page 24, line 2; and Figs. 3(a) and 3(b). Accordingly, no new matter is added.

Applicants submit that the present Amendment is merely formal in nature, is in accordance with the Examiner's instructions, and places the case in condition for allowance. Entry of the present amendment is proper to place the claims in better form for appeal.

Applicants respectfully request the Examiner to reconsider and withdraw the rejections in view of the following remarks.

Claim Objections

The Examiner has objected to claim 6 for depending on cancelled claim 5. Applicants have amended claim 6 to depend from claim 1. Accordingly, Applicants respectfully request that the objection be removed.

Issues under 35 U.S.C. § 103(a)

1) The Examiner has rejected claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over Tahara et al. '147 (US Patent 4,975,147) in view of Imai et al. '542 (US Patent 6,631,542), Kokubu '761 (JP 62-270761), and Kitano Kenzo et al. '214 (JP 2000-087214).

2) The Examiner has rejected claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Tahara et al. '147 in view of Imai et al. '542, Kokubu '761, and Kitano Kenzo et al. '214 and further in view of Dawes et al. '316 (US Patent 4,904,316).

Applicants respectfully traverse these rejections for the following reasons.

Legal Standard for Determining Prima Facie Obviousness

MPEP 2141 sets forth the guidelines in determining obviousness. First, the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. The four *Graham* factors are:

- (a) determining the scope and content of the prior art;
- (b) ascertaining the differences between the prior art and the claims in issue;
- (c) resolving the level of ordinary skill in the pertinent art; and
- (d) evaluating any evidence of secondary considerations.

Graham v. John Deere, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966).

Second, the Examiner has to provide some rationale for determining obviousness. MPEP 2143 sets forth some rationales that were established in the recent decision of *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Exemplary rationales that may support a conclusion of obviousness include:

- (a) combining prior art elements according to known methods to yield predictable results;
- (b) simple substitution of one known element for another to obtain predictable results;

(c) use of known technique to improve similar devices (methods, or products) in the same way;

(d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

(e) “obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success

(f) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;

(g) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

As the MPEP directs, all claim limitations must be considered in view of the cited prior art in order to establish a *prima facie* case of obviousness. See MPEP 2143.03.

Distinctions over the Cited Art

As the Examiner admits, Tahara et al. ‘147 fail to disclose the step of replacing the first mixed gas “with a second mixed gas when one-third to one-half of the processing time has elapsed.” However, the Examiner relies on Kokubu ‘761 and Kitano Kenzo et al. ‘214 to overcome this deficiency. Applicants respectfully traverse the Examiner’s interpretation of these two references.

The Examiner asserts that Kokubu ‘761 “teaches changing nitriding gas atmosphere during a nitriding process, for example, using different nitriding gas atmosphere in nitriding periods 3 to 7.” However, Kokubu ‘761 actually discloses the following for periods 3 to 7:

Period 3: Nitrogen gas is provided in the heat chamber (4) and the pressure inside the chamber is reduced to atmospheric pressure.

Period 4: The heat chamber (4) is heated.

Period 5: The heat chamber (4) is vacuumed and the product (2) is cleaned again.

Period 6: Nitriding gas having three components is provided in the heat chamber (4). The ratio of the components is maintained at 40 to 60 % by volume of ammonia, 0.2 to 3 % by volume of oxygen.

Period 7: Nitriding gas is exhausted from the heating chamber (4).

As described above, nitriding gas for the purpose of nitriding is provided for the first time in period 6, and after the treatment, the nitriding gas is exhausted. Kokubu '761 contains no disclosure or suggestion to provide a different second nitriding gas.

In Kitano Kenzo et al. '214, a nitriding process using a nitriding gas is disclosed. However, the nitriding gas of Kitano Kenzo et al. '214 is used as the first gas for nitriding immediately after the fluoride film is formed on the surface of the steel belt (10). Kitano Kenzo et al. '214 contain no disclosure or suggestion to use any different gas which substitutes the first gas to further nitride the steel belt (10).

In stark contrast, independent claim 1 includes the steps of:

introducing a first mixed gas comprising 50% to 90% by volume ammonia, 0.1% to 0.9% by volume oxygen, with the residual volume substantially comprising nitrogen, ***into said heating furnace*** at the processing temperature, and maintaining the furnace at the processing temperature, thereby forming a nitrated layer on the surface of the metal ring;

replacing the atmosphere inside said heating furnace with a second mixed gas when one-third to one-half of the processing time has elapsed, said second mixed gas comprising 0% to 25% by volume ammonia, with the residual volume substantially comprising nitrogen....

As discussed above, all of the cited references fail to disclose replacing the first mixed gas with a second mixed gas. Accordingly, one of ordinary skill in the art would have no reason, rationale, or motivation to replace a nitriding gas used in Kokubu '761 or Kitano Kenzo et al. '214 with another gas for nitriding a metal belt or to replace the nitriding gas of Kokubu '761 with the nitriding gas of Kitano Kenzo et al. '214.

Furthermore, claim 1, as amended, also recites, *inter alia*, that "a portion of nitrogen contained in said nitrided layer is evaporated into the atmosphere and eliminated from said metal ring, and another portion of nitrogen is diffused further inside said metal ring." The cited references fail to disclose or suggest this limitation. Due to this feature of the present invention, excellent toughness in the nitrided layer as well as in the non-nitrided portion inside is achieved (page 22, line 18 to page 24, line 2).

In the conventional method as shown in Fig. 3(b), the hardness sharply decreases within a depth range of 10 μm from the surface. In the present invention as shown in Fig. 3(a), the hardness curve does not show a sharp decrease in this range, and the curve is more constant. This result is due to a sudden change of the amount of nitrogen in the metal ring being reduced as a result of a portion of nitrogen contained in the nitrided layer being evaporated into the atmosphere and another portion of nitrogen being diffused further inside the metal ring as recited in amended claim 1.

As discussed above, Tahara et al. '147 in view of Kokubu '761 and Kitano Kenzo et al. '214 do not disclose each and every aspect of claim 1, from which claims 2, 3, and 6 depend. Applicants respectfully submit that Imai et al. '542 and Dawes et al. '316 do not overcome the deficiencies of these references.

To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be disclosed by the prior art. (See MPEP 2143.03). As discussed above, the combination of references fails to disclose all the claim limitations of independent claim 1, and those claims dependent thereon. Therefore, a *prima facie* case of obviousness has not been established, and withdrawal of the outstanding rejection is respectfully requested.

As stated in *KSR International Co. v Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007), “rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” Furthermore, the mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art. *Id.* As described above, Applicants have shown that the present invention achieves unexpected and unpredictable results.

For the reasons given above, the combination of references does not render the present invention obvious because the cited references do not disclose at least one feature of the present invention and its effects. Furthermore, the cited references provide no reason or rationale that would allow one of ordinary skill in the art to arrive at the present invention as claimed. Any contentions of the USPTO to the contrary must be reconsidered at present.

Applicants respectfully submit that all of the remaining issues in the application are herein fully resolved. Therefore, reconsideration and withdrawal of the outstanding rejections are respectfully requested.

CONCLUSION

In view of the above amendments and remarks, Applicants believe the pending application is in condition for allowance.

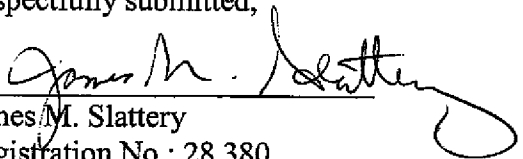
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Chad M. Rink, Reg. No. 58,258 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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